

REMARKS

Attached hereto is a Fee for nine (9) independent claims in excess of three (3) independent claims.

Claims 1-15 are pending in the application. This Amendment currently amends claims 1, 2, and 4-11 and adds new claims 14 and 15. No new matter is added to currently amended claims 1, 2, and 4-11 or to new claims 14 and 15. Claims 1, 2, and 4-11 are currently amended to merely clarify the subject matter of the claims and in no way narrow the scope of the claims in order to overcome the prior art or for any other statutory purpose of patentability.

Notwithstanding any claim amendments of the present Amendment or those amendments that may be made later during prosecution, Applicant's intent is to encompass equivalents of all claim elements. Reconsideration in view of the foregoing amendments and the following remarks is respectfully requested.

Applicant gratefully acknowledges the indication by the Examiner that claims 4-11 would be allowable if rewritten in independent form. Applicant respectfully submits that claims 4-11 are rewritten in independent form, above, and should be allowed.

Claims 1-3 and 12-13 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,347,526 to Suzuki et al. (hereinafter, Suzuki).

This rejection is respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention, as described in claim 1, is directed to a method of performing digital optical communications to transmit an optical signal through an optical fiber that comprises shaping a waveform of the optical signal being transmitted through the optical fiber by increasing the frequency thereof before the power is stabilized, when the optical signal starts increasing in level at a time the optical signal is applied to the optical fiber.

The claimed invention, as described in claim 2, is directed to a semiconductor laser that modulates from a first level to a second level that comprises a diffraction grating for effecting distribution feedback, the diffraction grating having a normalized coupling coefficient kL of at least 2.0, the diffraction grating having a phase shift region disposed

therein for achieving a phase shift of at most $\lambda/4$, and an active layer including a multiple quantum well structure, having a gain saturation coefficient of greater than 0, such that the gain is saturated as a carrier concentration in the active layer increases.

An aspect of the present invention describes that "when the semiconductor laser is biased to the "1" level, as the frequency is progressively varied to a stable value, the carrier concentration of the active layer increases, and the differential gain decreases. Since the frequency of relaxation oscillations of the semiconductor laser is proportional to the square root of the differential gain, it can be understood that if there is an effect of dynamically reducing the differential gain as described above, then the time required for the optical frequency to become stabilized at the frequency f_1 is increased. Heretofore, the above effect is essentially unavailable because the gain saturation coefficient is set to substantially 0." (Specification, page 14, lines 7-17; emphasis added).

II. THE PRIOR ART REJECTION

Applicant respectfully submits that the Office Action has improperly rejected the claims because "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131. Applicant will show that the Office Action has mischaracterized the present invention and consequently misapplies the art of Suzuki.

The Office Action alleges "[r]egarding claim 1, Suzuki inherently discloses the claimed invention, because applicant's claim 1 of a method suggests a semiconductor laser comprising a phase-shifted region of a diffraction grating and having a normalized coupling coefficient k_L of 2 or more and Suzuki et al teaches it as evidenced by col. 9, lines 50-60. In Applicant's specification, particularly paragraphs [0051] through [0056], applicant appears to credit the k_L of 2 - 3.5 for enabling the claimed feature of 'shaping the waveform of the optical signal to be transmitted through the optical fiber to increase the frequency thereof before the power is stabilized when the optical signal starts increasing in level at the time the optical signal is applied to the optical fiber.'"

The claimed invention, however, includes more than just a normalized coupling coefficient, k_L , of 2 or more, as described in Suzuki. In relevant part, the Specification also describes, "One condition for the phase shift DFB laser ... to increase the frequency

progressively toward f_1 with time is that a normalized coupling coefficient κL is greater than a conventional value." (Specification, page 12, lines 1-4; emphasis added). The Specification also describes, "If the normalized coupling coefficient κL is large and a gain saturation coefficient ϵ (described later on) is large ... the carrier concentration at the stable level after the step response increases, and the wavelength is shifted into a shorter wavelength than usual. If the amount by which the wavelength is shifted into the shorter wavelength is larger than the amount by which the wavelength is shifted into the longer wavelength range, then the frequency progressively increases toward f_1 with time, resulting in the compression of the pulse." (Specification, page 12, line 22 to page 13, line 7; emphasis added).

In fact, three exemplary features of the invention are described from page 11, line 19, to page 15, line 13.

The first exemplary feature of the invention, which is claimed by some of the independent claims, describes an optimum range for the normalized coupling coefficient κL as 2.0 to 3.5 (Specification, page 12, lines 16-17).

The second exemplary feature of the invention, which is claimed by some of the independent claims, is that in order to increase the time in which to stabilize the frequency at f_1 , the semiconductor laser is of such a structure that the optical gain of the active layer is saturated as the carrier concentration increases (Specification, page 13, lines 22-24).

The third exemplary feature of the invention, which is claimed by some of the independent claims, is that to effect shifting the frequency into a higher frequency range to improve the transmission characteristics, it is effective to reduce the phase shift of the phase-shifted DFB laser to a value smaller than the conventional value of $\lambda/4$.

Nowhere does Suzuki disclose, teach or suggest the second exemplary feature of the invention, described above. Therefore, the Office Action's argument of inherency to the second exemplary feature, as regards Suzuki, to the rejection of claim 1 fails.

That is, after a step response, the carrier concentration at the stable level increases, and the wavelength is shifted into a shorter wavelength, such that the frequency progressively increases toward f_1 with time, resulting in the compression of the pulse, in part, due to a structure of the semiconductor laser, which allows the carrier concentration to increase in the active layer, such that, the optical gain of the active layer is saturated.

Claim 1, without importing the fallacious argument of inherency, recites at least the

features of "shaping a waveform of the optical signal transmitted through the optical fiber by increasing the frequency thereof before the power is stabilized, when the optical signal starts increasing in level at a time the optical signal is applied to the optical fiber."

Nowhere does Suzuki disclose, teach or suggest that the frequency of a waveform of an optical signal is shifted. Therefore, Suzuki does not disclose, teach or suggest the features of "shaping a waveform of the optical signal transmitted through the optical fiber by increasing the frequency thereof before the power is stabilized, when the optical signal starts increasing in level at a time the optical signal is applied to the optical fiber," as recited in claim 1.

For at least the reasons outlined above, Applicant respectfully submits that Suzuki is an improper reference as applied to claim 1. Withdrawal of the rejection of claims 1 under 35 U.S.C. §102(b) as anticipated by Suzuki is respectfully solicited.

Regarding originally filed claim 2, the Office Action asserts that "an active layer having a gain which is saturated as a carrier concentration in the active layer increases" does not structurally distinguish from the prior art.

Claim 2 recites at least the features of "an active layer including a multiple quantum well structure, having a gain saturation coefficient of greater than 0, such that said gain is saturated as a carrier concentration in the active layer increases."

Applicant respectfully submits that claim 2 describes a physical property of the active layer, i.e., a gain saturation coefficient, which is attributable to the structure of the semiconductor laser, as clearly recited at page 13, lines 22-24 of the Specification.

Applicant also respectfully submits that nowhere does Suzuki disclose, teach or suggest the feature of "an active layer including a multiple quantum well structure, having a gain saturation coefficient of greater than 0," as recited in claim 2. In fact, the Specification clearly recites at page 14, lines 16-17. "[h]eretofore, the gain saturation coefficient ϵ is set substantially to 0."

For at least the reasons outlined immediately above, Applicant respectfully submits that Suzuki fails to disclose, or to teach or suggest, every feature of claim 2. Accordingly, Suzuki fails to anticipate the subject matter of claim 2 and claims 3, 12, and 13, which depend upon claim 2, under 35 U.S.C. §102(b). Withdrawal of the rejection of claims 2, 3, 12, and 13 under 35 U.S.C. §102(b) as anticipated by Suzuki is respectfully solicited.

III. CONCLUSION

In view of the foregoing, Applicant submits that claims 1-15, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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